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Dated 1 July 2003



W. J. L. 1

- 6 JUL 2002



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1. Your reference		P/6764		1- 6 JUL 2002 08JUL02 E731853-4 D01607 POL/7700 0.00-0215735.2	
2. Patent application number (The Patent Office will fill in this part)		0215735.2			
3. Full name, address and postcode of the or of each applicant (underline all surnames)		1) CNH U.K. Ltd., Cranes Farm Road, Basildon ESSEX SS14 3AD 8349532001 2) Iveco (UK) Ltd, Iveco Ford House, Station Road, Watford, HERTS WD1 1SR 7460603001 3) Cummins Engine Company Limited, Yarm Road, Darlington, County Durham DL1 4PW All three British companies. 5615224002			
Patents ADP number (if you know it) If the applicant is a corporate body, give the country/state of its incorporation					
4. Title of the invention		Seal Accessibility Device			
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"Address for service" in the United Kingdom to which all correspondence should be sent (including the postcode)		A. Messulam & Co. Ltd 43-45, High Road Bushey Heath Herts WD23 1EE			
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DUPLICATE

- 1 -

Seal Accessibility Device

Field of the invention

5 The present invention relates to an ancillary unit adapter for use in an engine block which has at one end a lateral flange formed with an aperture for mounting the ancillary unit.

10 Background of the invention

 The invention particularly finds application in so-called structural engines, as used in agricultural tractors. Instead of being supported on resilient mounts on a vehicle
15 body or chassis, a structural engine and its transmission train together form the unsprung mass or chassis of the vehicle. For this reason, the engine block needs to be designed to provide strength and rigidity.

20 The rear end of the block of a structural engine commonly has a flange that projects laterally and is used to support ancillary units, such as a fuel pump and a hydraulic pump to be driven by the crankshaft. The ancillary unit mates with the forward facing surface of the lateral flange
25 and this surface must therefore be machined accurately after the engine block has been cast. In a structural engine, for additional strength, the block has laterally projecting ribs that are joined to the lateral flange on which the ancillary unit is mounted and these ribs interfere with the machining
30 of the forward facing surface of the flange.

 In order to enable an ancillary unit to be mounted on the lateral end flange of an engine without the need to machine the forward facing surface of the end flange, it has
35 been proposed in GB-A-2342391 to mount an adapter on the rear end face of the lateral flange to overlie the aperture for the ancillary unit, the surface of the adapter plate

facing the aperture being machined to mate with an ancillary unit disposed on the other side of the flange and secured to the adapter plate through the aperture in the lateral flange.

5

As a development of the adapter plate disclosed in GB-A-2342391, it has also previously been proposed to provide a drive adapter as shown in Figure 1 of the accompanying drawings. The known adapter comprises a casing 12 for mounting on the end face of the lateral flange 10 to overlie the aperture, which casing 12 is sealed relative to the aperture by means of O-rings 28 and 30. The casing 12 has ears 14 for receiving bolts that secure the adapter to the end face of the engine. A drive shaft 16, which is 15 journaled in the casing 12 by means of bearing shells 18, is formed at one end with a formation, such as a splined hole 22, for enabling the drive shaft 16 to be coupled to the input shaft of the ancillary unit. At its other end, the drive shaft 16 is provided with a cog 20 that meshes with 20 the flywheel or another engine driven gear. The drive shaft 16 is formed with a double shoulder 24 and the cog 20 fits over a reduced diameter portion of the shaft 16. A retaining plate 26 screwed to the casing 12 abuts the shoulder 24 and the cog 20 to resist axial loads on the shaft 16 and holds 25 the shaft 16 in the casing 12.

In the known drive adapter, the casing 12 is sealed relative to the engine flange 10 by means of two O-rings 28. Oil for lubricating the bearing shells 18 is supplied 30 through a passage (not shown) lying between the two O-rings. If the O-ring 28 shown to the left in Figure 1 should fail then an undesirable leak will occur. Replacement of the O-ring in the known drive adapter could only be carried out by first removing the adapter from the engine and this 35 operation itself necessitated separating the engine from the transmission.

Object of the invention

The present invention seeks to improve on the known drive adapter by allowing replacement of the O-ring without
5 the need to remove the adapter from the engine flange.

Summary of the invention

According to a first aspect of the present invention,
10 there is provided an adapter for use in mounting an ancillary unit in an engine block which has at one end a lateral flange formed with an aperture for mounting of the ancillary unit, the adapter comprising a casing for mounting on the end face of the engine to overlie the aperture, which
15 casing is provided with an O-ring for effecting a seal between the casing and the aperture in the lateral flange of the engine, characterised in that the casing has a larger diameter portion separated by a shoulder from a portion of reduced diameter, a retaining sleeve axially slidable over
20 the reduced diameter portion of the casing and a O-ring held captive between the axial end of the retaining sleeve and the shoulder.

The simplification afforded by the present invention is
25 that it enables the O-ring that seals between the adapter and the engine flange to be replaced without removal of the adapter from the flange. If the retaining sleeve is slid off the end of the casing, it is possible to tease out the defective O-ring and to replace it. As the retaining sleeve
30 is pushed back over the reduced diameter portion of the casing, it will push the replacement O-ring towards the shoulder and when after the O-ring abuts the shoulder the retaining sleeve will axially compress the O-ring and simultaneously deform it radially into seal contact between
35 the outer surface of the casing and the aperture in the engine flange.

Thus, in accordance with a second aspect of the invention, there is provided a method of replacing the O-ring seal of an adapter as claimed in any preceding claim, which comprises the steps of removing the ancillary unit
5 from the adapter, sliding the retaining sleeve off the reduced diameter portion of the casing, extracting the O-ring seal from the gap between the casing and the surrounding aperture in the engine lateral flange, fitting a new O-ring over the reduced diameter portion of the casing,
10 sliding the retaining sleeve on to the reduced diameter portion of the casing to push the new O-ring towards the shoulder defined by the casing, and mounting the ancillary unit on the adapter so as to compress the new O-ring between the retaining sleeve and the shoulder.

15

While the adapter may simply comprise an adapter plate with a bore for supporting the input shaft of the ancillary unit, it is preferred for the adapter to be a drive adapter that additionally comprises a shaft journaled in the
20 casing, a formation at one end of the shaft to enable the shaft to be coupled to the input shaft of the ancillary unit and a cog solid with the opposite end of the shaft for meshing with an engine driven gear.

25 For convenience, in the ensuing description, it will be assumed that the end of the block on which the lateral flange is formed is the rear end to which the gearbox housing is connected but the invention is equally applicable to either end of the engine.

30

In a preferred embodiment of the invention, the drive shaft is formed as a hollow shaft. This enables simple broaching of a splined formation at one end of the shaft and also, with the provision of suitable oil galleries, permits
35 oil for lubrication to reach the splined formation and the axial bearing surfaces of the cog.

The invention in common with that in GB-A-2342391 avoids the need to machine the forward facing surface of the lateral flange by mounting an adapter on its rear side so that the ancillary unit mates with the adapter rather than with the flange. This allows the face to which the ancillary unit mates to be machined without hindrance from any part of the block. The adapter needs itself to be mounted on a machined surface on the flange but as this surface is outward facing, it can readily be machined at the same time as other parts of the end surface of the engine block that mate with the gearbox (or the engine front cover).

A further advantage is that the same engine block can be used with ancillary units of different design by changing only the adapter. Hence, by using an alternative adapter, it is possible to move the centre of the drive shaft of the ancillary unit radially with respect to the crankshaft axis.

Brief description of the drawings

20

The invention will now be described further, by way of example, with reference to the accompanying drawings, in which:

Figure 1 is, as described above, a section through a known drive adapter,

Figure 2 is a similar section through a drive adapter of the present invention,

Figure 3 is a partially exploded perspective view of the drive adapter of Figure 2, and

Figure 4 is an exploded view of the casing of the drive adapter shown in Figure 2 and 3.

Detailed description of the preferred embodiment

Referring now to Figures 2 to 4, a drive adapter of the invention comprises a casing 112 that fits in the opening in the lateral flange 10 of the engine block and is sealed

relative to the opening by a pair of O-rings 128 and 130. The casing 112 had projecting ears 114 that receive bolts 115 to secure the drive adapter to the rear end face of the engine. A drive shaft 116 is supported in the casing on two
5 axially spaced bearing shells 118.

The drive shaft 116 has a constant external diameter and a cog 120 is fixed to its end projecting from the casing 112. The fixing of the cog 120 to the drive shaft 116 is
10 solid, so that the cog can neither rotate relative to the drive shaft 116 nor move axially relative to it. The fixing of the cog 120 on the drive shaft 116 can be performed in any suitable manner, for example the cog 120 may be an interference fit or a shrink fit on the drive shaft 116 or
15 else the drive shaft 116 may be formed with a flat engaged by a grub screw in the cog 120.

The cog 120 has a forward facing annular surface 120b that abuts a collar 112a (best seen in Figures 3 and 4) that
20 projects from the casing 112 around the shaft 116. This forms a first axial thrust bearing surface to withstand forces tending to move the drive shaft 116 to the left as viewed in Figure 2. The cog 120 also has a rearward facing annular surface 120a that abuts the cover 40 fitted over the
25 engine flywheel to withstand axial loads urging the drive shaft 116 to the right as viewed in Figure 2.

The drive shaft 116 is hollow and its end remote from the cog 120 is broached internally to form a splined
30 connector 122. This acts as a coupling for receiving the externally splined front end of the input shaft of the ancillary unit, such as a hydraulic pump, that is to be driven by the engine through the drive adapter.

35 Oil for lubrication of the drive shaft bearing shells 118 is fed through a suitable opening (not shown) into the space between the two bearing shells 118 and flows axially

past the shells 118. The oil that passes the shell 118 shown to the right in Figure 2 serves also to lubricate the axial bearing surface 120b. The oil that passes the shell 118 shown to the left in Figure 2 acts to lubricate the splined coupling 122. The bearing surface 120a is lubricated by oil dripping along the cover 40. It will be seen in Figure 2 that the bearing surface 120a contacts a raised ridge of the cover 40 and it is preferred that the ridge be formed as a crescent (rather than as a continuous ring) with an upward facing opening so as to act as a collector for oil draining along the surface of the cover 40. In case too much oil should collect within the shaft, it is possible to provide a small drainage hole to enable surplus oil to drip back into the flywheel housing.

The oil enters the casing 112 from the engine through a gallery formed in the space between the two O-rings 128 and 130. If oil should pass the O-ring 128 then it will only flow into the flywheel housing and will not leak. However, oil that flows past the O-ring 130 will escape from the engine and form an undesirable leak.

In the prior art drive adapter, in the event of failure of the equivalent O-ring 28, it could only be replaced by removal of the drive adapter from the engine and this would entail separating the engine from the gearbox. By contrast, in the embodiment of the invention illustrated in Figures 2 to 4, this task is simplified in that the O-ring 130 is held in place between a shoulder 131 on the casing and the axial end of a retaining sleeve 132 which can be removed while the drive adapter remains in place. After the sleeve 132 has been withdrawn axially, the O-ring 132 can be removed, for example it can be teased out with a pin, and its replacement will be pushed into position when the sleeve 132 is again slid over the end of the casing 112. A seal is achieved in that the O-ring is deformed radially as a result of it being

clamped axially between the end of the retaining sleeve 132 and the facing shoulder 131 on the casing 112.

Prior to the mounting of the ancillary unit to the drive adapter, a temporary cover plate 134 is used to close off the end of the casing 112 and to hold the retaining sleeve 132 in position. The cover 134 is held by means of bolts 136 that engage in the mounting holes for the ancillary unit and a gasket 138 is used to seal against oil leaks, if the engine is operated without the ancillary unit in place.

The drive adapter is mounted on the engine before the gearbox is fitted to the engine. At this time the axial end face of the engine is exposed and the casing 112 can be secured in position by means of the three bolts 115. The drive shaft 116 and its cog 120 can now be inserted into the casing 112 and once the flywheel cover is mounted on the engine, the cog 120 will be held captive between the engine and the flywheel cover preventing axial movement of the drive shaft 116.

To mount the ancillary unit on the engine, the cover plate 134 is removed and the bolts 136 are used to secure the ancillary unit to the drive adapter in its place. Torque can then be transmitted from the engine driven gear that meshes with the cog 120 to the drive shaft 116 and through the splined coupling 122 to the input shaft of the ancillary unit. As the bolts 136 are tightened to clamp the ancillary unit to the adapter casing 112, the retaining sleeve 132 is moved axially over the reduced diameter portion of the casing 122 and its axial end exerts a clamping force on the O-ring 130 which is held captive between the retaining sleeve 132 and the shoulder 131.

CLAIMS

1. An adapter for use in mounting an ancillary unit in an engine block which has at one end a lateral flange formed with an aperture for mounting of the ancillary unit, the adapter comprising a casing for mounting on the end face of the engine to overlie the aperture, which casing is provided with an O-ring for effecting a seal between the casing and the aperture in the lateral flange of the engine, characterised in that the casing has a larger diameter portion separated by a shoulder from a portion of reduced diameter, a retaining sleeve axially slidable over the reduced diameter portion of the casing and a O-ring held captive between the axial end of the retaining sleeve and the shoulder.

2. An adapter as claimed in claim 1, wherein the adapter further comprises a shaft journalled in the casing, a formation at one end of the shaft to enable the shaft to be coupled to the input shaft of the ancillary unit and a cog solid with the opposite end of the shaft for meshing with an engine driven gear.

3. An adapter as claimed in claim 2, wherein the part of the drive shaft engaged by the cog has the same diameter as the part journalled in the casing.

4. An adapter as claimed in claim 2 or 3, wherein the drive shaft is formed as a hollow shaft.

5. An adapter as claimed in claim 4, wherein an internally splined coupling is formed by broaching one end of the shaft.

6. An adapter as claimed in claim 4 or 5, wherein an oil passage is provided to open into the hollow shaft to

provide oil for lubricating one of the thrust bearing surfaces of the cog.

7. A drive adapter as claimed in any preceding claim,
5 wherein in use the axis of the input shaft of the ancillary unit is located eccentrically with respect to the casing.

8. A method of replacing the O-ring seal of an adapter as claimed in any preceding claim, which comprises
10 the steps of :-

removing the ancillary unit from the adapter,
sliding the retaining sleeve off the reduced diameter portion of the casing,

extracting the O-ring seal from the gap between the
15 casing and the surrounding aperture in the engine lateral flange,

fitting a new O-ring over the reduced diameter portion of the casing,

sliding the retaining sleeve on to the reduced diameter
20 portion of the casing to push the new O-ring towards the shoulder defined by the casing, and

mounting the ancillary unit on the adapter so as to compress the new O-ring between the retaining sleeve and the shoulder.

ABSTRACT

Seal Accessibility Device

5 An adapter is disclosed for use in mounting an
ancillary unit in an engine block which has at one end a
lateral flange formed with an aperture for mounting of the
ancillary unit. The adapter comprises a casing 112 for
mounting on the end face of the engine to overlies the
10 aperture, which casing is provided with an O-ring 130 for
effecting a seal between the casing 112 and the aperture in
the lateral flange of the engine. The casing has a larger
diameter portion separated by a shoulder 131 from a portion
of reduced diameter, a retaining sleeve 132 axially slidable
15 over the reduced diameter portion of the casing 112 and a O-
ring 130 held captive between the axial end of the retaining
sleeve 132 and the shoulder 131.

Figure 2.



1/2

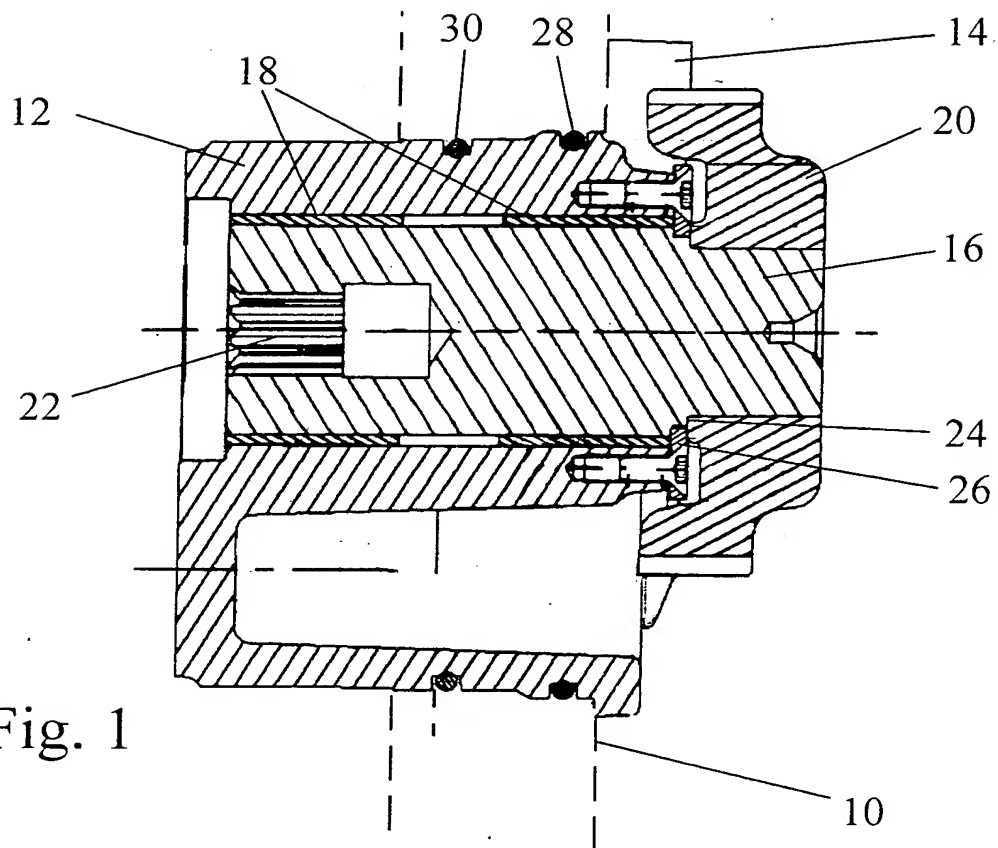


Fig. 1

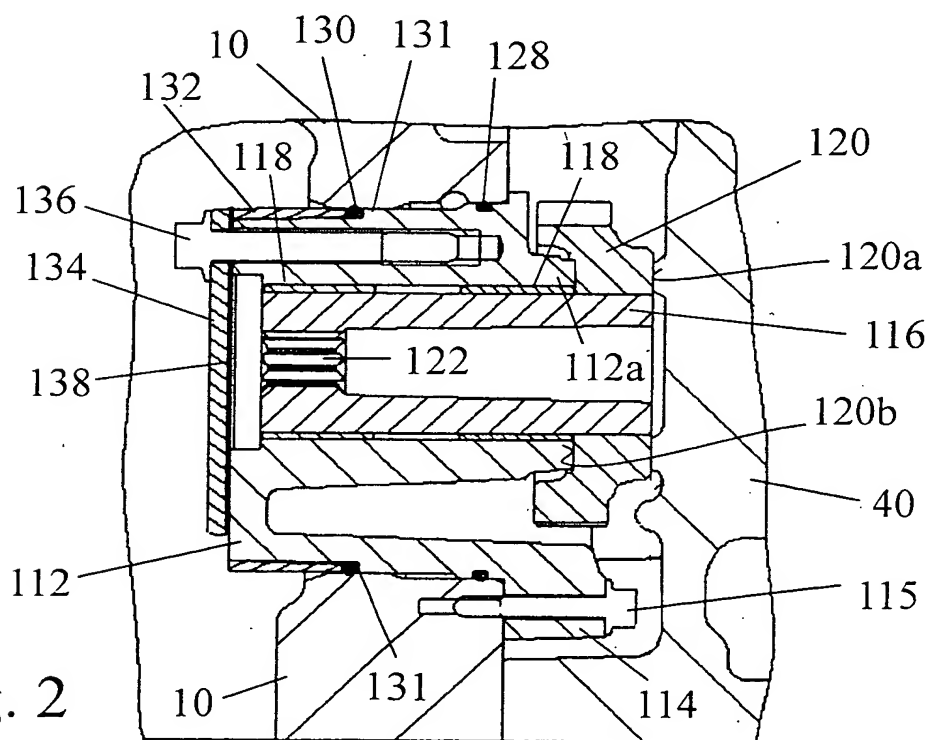


Fig. 2



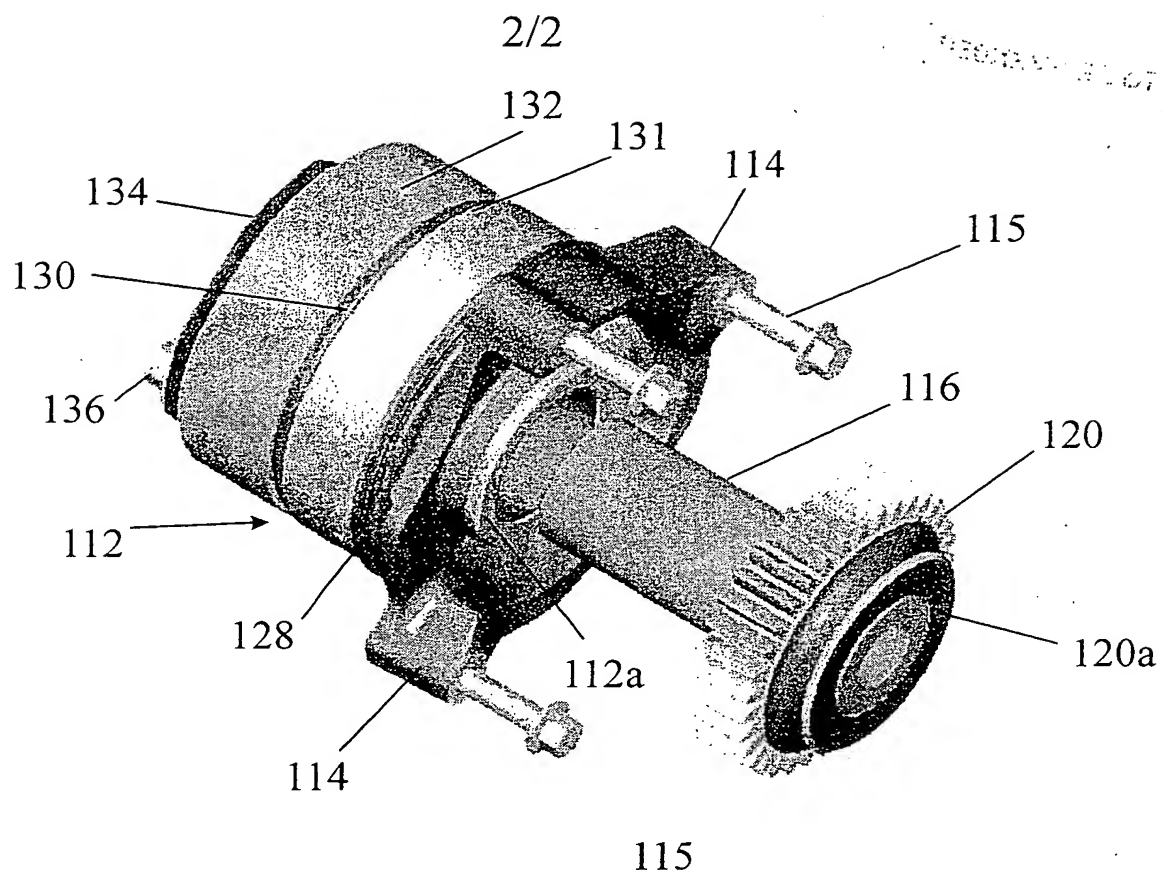


Fig. 3

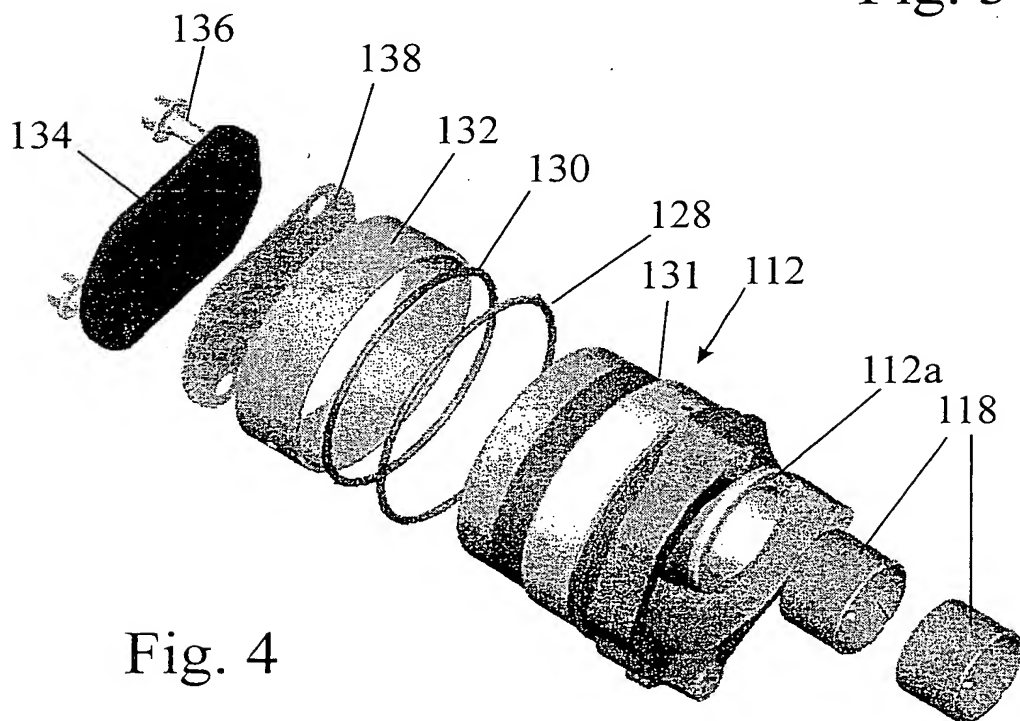


Fig. 4

